Cladocera cultivation in different ways in the laboratory

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Abstract:
The article identifies feed rations, feed coefficients for the cultivation of horned crustaceans used as feed in various methods in the laboratory.

Key words: Daphnia, D. Magna, Simosephalus expinosus, Simosephalus vetulus, Simosephalus serrulatus.

Goals and objectives of the work.
In fish breeding, it is the study of the natural nutrients of fish and the determination of which food to consume during the development of the fish. The amount of natural food resources depends mainly on water quality.

The productivity of animals is determined by their growth, the rate of reproduction and the duration of their survival under different conditions. Typically, mass-produced objects are distinguished by their productivity. Reproduction of daphnia in the laboratory has been going on for many years. Crustaceans are grown as an indicator organism to carry food or biotest, mainly to fish fry. Daphnia are mainly used in experiments. Below is a summary of our experiences.

Among the species belonging to the genus Daphnia, D. magna is distinguished by the most productive feature. This shrimp produces more than 100 offspring in each calving process. The incubation period lasts 2-3 days.

The growth and development of the Simosephalus vetulus (O.F. Muller) crustacean was observed from August 11 to August 27 in water with a temperature of 23.70 °C. In females of this shrimp, sexual maturation occurred 5 days after birth, when the average body length was 1.86 mm. The average length of newborn shrimp was 0.65 mm, while the body length of the females reached 2.37 mm at maturity. The first breeding took place after 7 days, and the reproduction period of the offspring averaged 2.5 days. An average of 17 specimens of shrimp were produced in each offspring, with an average growth rate of 10.8% overnight.
The growth and development of the Simosephalus vetulus (O.F. Muller) crustacean was observed from August 11 to August 27 in water with a temperature of 23.7°C. In females of this shrimp, sexual maturation occurred 5 days after birth, when the average body length was 1.86 mm. The average length of newborn shrimp was 0.65 mm, while the body length of the females reached 2.37 mm at maturity. The first breeding took place after 7 days, and the reproduction period of the offspring averaged 2.5 days. An average of 17 specimens of shrimp were produced in each offspring, with an average growth rate of 10.8% overnight. When the data obtained were compared with the literature data, this process was performed by M.L. In the experiment of Pidgayko (1968) we see that the reproduction of Simosephalus vetulus after 14 days, the spacing period of reproduction is 5 days, and the maximum length of females is 1.95 mm. L.I. Comparing the data from Lebedova’s experiment in the Ribinsky Reservoir (1968), we can see that these figures are 1.88 mm long in the 15-day Simosephalus vetulus, with an average number of shrimp in each reproduction of 5 specimens. As can be seen, the average quantitative indicator of reproduction is L.I. Comes close to the maximum numbers of Lebedova (1968).

Observation of the growth and development of Simosephalus expinosus was carried out from 13 June to 2 July when the temperature index was 23.8–24.9°C. The sexual maturation of this shrimp took 7 days and the maturation of the eggs in the release chamber lasted 2 days. The first breeding took place after 9 days, when the height of the shrimp was 1.93 mm and the size of the female mother shrimp was 2.31 mm. The average number of shrimp in the offspring was 12 specimens. The daily growth rate for the period observed was found to be 9%. As can be seen, we have witnessed that the reproductive product of Simosephalus expinosus is much lower than that of Simosephalus vetulus.

Simosephalus serrulatus is also somewhat similar in appearance to daphnia. Therefore, the methods of growing them will be much more similar. The main difference is that the container in which S. serrulatus is grown must contain aquatic higher plants (e.g., elodea, valisneria, etc.). Under natural conditions, S. serrulatus is a crab that lives in the litoral zone, i.e., near the shoreline of water bodies covered with high aquatic plants, and attaches to higher plants in terms of lifestyle using antennae on the back of its body. This is due to the fact that in the lithoral zone there is a special device to avoid the flow shift in the waves that are constantly taking place. It also likes to cling to the same objects when grown in aquariums and jars. The optimum growth temperature of S. serrulatus is 18-240 C. The feed rate is slightly less than that
of daphnia. This is because the body of S. cerrulatus is slightly smaller. When grown in groups, they were placed at the rate of 5 shrimp per 100 ml of water. Each day, 1 ml of aqueous suspension was added to a 3 l volume container in which S. serrulatus was grown. Feeding can be slightly reduced if successive feeding is carried out. When the flowering of algae in the pot was observed, the water was of course changed. The method of changing the water is done in the same way as in Daphnia. When S. serrulatus is grown individually, a very small amount of high aquatic plant is discarded. It is also enough to feed the shrimp with 1 drop of water once every 2 days. In this case, shrimp of S. serrulatus are born in 10-13 days, and then in 1-2 days this process is repeated. The size of young shrimp is so small that it is very difficult to see them with the naked eye. After a day, you will be able to see and count them a bit. Therefore, it is more convenient to use the following method to determine the breeding of S. serrulatus: From the first calving, the mother shrimp was transferred to another vessel. She then spent a day counting when her children appeared. Otherwise, mistakes can be made in practice.

The average length of the Simocephalus serrulatus species is 2-2.3 mm and grows well in coastal zones and in waters completely covered with tall vegetation. But it occupies a very large area in terms of distribution. However, it is an atsedophilic animal and prefers waters with low pH (Manuylova, 1984; Pidgayko, 1964; Andronnikova, 1996).

In 2017-2018, experiments were conducted on growing Ceriodaphnia reticulata crustaceans in polyethylene kapron bags in warm water in an aquarium. To do this, crustaceans were placed in aquariums of various sizes. The water was filtered through gas-68. 300-500 C. reticulata monocultures of shrimp were placed in each aquarium. Hydrolyzates of crushed yeast were used as feed at the rate of 19 g / m³. Every 6-7 days during the experiment, the same amount of feed (3.8 g each) was given. When the temperature exceeded 280 C, the feed was given every 10 days. The amount of water in the aquariums was always kept the same. Crustaceans were counted every 6-7 days using gas № 68. Full use of the plant was carried out after 20–25 days. In 2018, C. reticulata was isolated from polyethylene and № 46 kapron sieves I.B. Grown in ponds designed by Bogatova. The volume of water in the kapron pools was 0.2 m3 and was supplied with feed similar to that of polyethylene bags. The process of complete capture of C. reticulata in water basins was carried out after 15-20 days, depending on the degree of contamination. In April and early May, the product was harvested after 8–10 days.

When the temperature in the ponds was 16–180 C, parthenogenetic female shrimp multiplied. At this time, one to 22 eggs were observed in the analyzes taken from the excretory chamber. Overnight yield in polyethylene bags was 9.9-35.6 g / m³ and in kapron bags 15-113 g / m³.

When the weight reaches 3 mg, the ration is sharply reduced. At this weight, the larvae can consume practically any size C. reticulata. The quantitative decrease in the feed ration at 3-5 mg of larvae is probably related to temperature. Because experiments with larvae in this age category were conducted at relatively low temperatures. The temperature dependence of the feed ration was given (Table 1).

<table>
<thead>
<tr>
<th>Temperature of water (°C)</th>
<th>Daily ration (% of dry weight)</th>
<th>Temperature of water (°C)</th>
<th>Daily ration (% of dry weight)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>28,3</td>
<td>19</td>
<td>47,0</td>
</tr>
<tr>
<td>16</td>
<td>27,1</td>
<td>20</td>
<td>41,9</td>
</tr>
<tr>
<td>17</td>
<td>26,0</td>
<td>21</td>
<td>57,0</td>
</tr>
<tr>
<td>18</td>
<td>34,4</td>
<td>22</td>
<td>41,7</td>
</tr>
</tbody>
</table>

A drop in water temperature above 180 C affects the amount of daily ration. When the temperature was 19-220 C, the ration changed very little. These data revealed that a
temperature index of 19–220°C was considered optimal for the larvae of carp fish.

During the experiment, nutrient coefficients were also determined when feeding larvae of carp fish with C. reticulata. At the same time, 1 liter of water was taken and 20 larvae were grown (Table 2).

- Table

<table>
<thead>
<tr>
<th>Feed concentration mg / l</th>
<th>Larvae weight, mg</th>
<th>Total growth in 5 days, mg / l</th>
<th>Feed consumed in 5 days, mg / l</th>
<th>Feed coefficient</th>
<th>K₁ %</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-20</td>
<td>1.4</td>
<td>2.05</td>
<td>8</td>
<td>22.6</td>
<td>2.86</td>
</tr>
<tr>
<td>50-70</td>
<td>1.4</td>
<td>2.75</td>
<td>27</td>
<td>83.2</td>
<td>3.08</td>
</tr>
<tr>
<td>70-100</td>
<td>1.4</td>
<td>2.80</td>
<td>28</td>
<td>82.8</td>
<td>2.96</td>
</tr>
<tr>
<td>100-200</td>
<td>1.4</td>
<td>2.37</td>
<td>19.5</td>
<td>78.8</td>
<td>4.04</td>
</tr>
<tr>
<td>200-300</td>
<td>1.4</td>
<td>2.60</td>
<td>24</td>
<td>134.0</td>
<td>5.58</td>
</tr>
<tr>
<td>All</td>
<td>1.4</td>
<td>1.97</td>
<td>115.5</td>
<td>401.4</td>
<td>3.47</td>
</tr>
</tbody>
</table>

When the feed concentration was 10–100 mg / l, the feed ratio was found to be relatively low, i.e., around 2.5–3. It was observed that when the concentration is in the range of 100-200, its coefficient can be up to 4, and in the range of 200-300, it has the highest nutrient coefficient.

According to previous data (Braginskaya R.Ya., 1960; Tagirova N.Ya. 1968) it was calculated that the larvae of cornfish have the best growth ability at a concentration of 70-100 mg / l of C. reticulata. In our experiments, it was observed that while this concentration serves as an optimal indicator, the highest coefficient is much higher than 100. It should be noted that for the cultivation of 11-12 mg cornfish larvae, the nutrient content of C. reticulata is 3.0-3.2, 17-190°C, and the ration corresponds to 30-32% of the raw weight of the larvae detected.

C. reticulata crustaceans, propagated in the laboratory, can increase fish productivity as a result of their use in fishery basins.

**References**